

# CRITIQUE SUMMARY

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**Critique No.:** CR-C-A-2001-0005

**Date of Critique:** April 2001

**Critique Leader:** Lori Stiegler

**Meeting Participants:** M. Carroll, A. Etkin, R. Karol, J. Levesque, T. Monahan, A. Nicoletti, J. Scott, L. Stiegler

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**Brief Event Description:** On 4/18/01 approximately 100 gallons of UCON lubricating fluid UCON LB170X was found to have leaked from a broken fitting on a compressor pumping skid in building 1005H. Most of the fluid was contained within the skid. Some leaked out onto the floor, and a small amount (less than 5 gallons) went into the trench. The compressor shut down automatically due to interlocks at that time. However, due to residual pressure in the lines, a portion of the fluid was also atomized into the air from the small slit in the fitting, creating a fog-like atmosphere which activated the smoke detection system. The spill was reported to Fire/Rescue and spill cleanup was initiated. Based on the quantity and type of fluid (it is not petroleum based) the event was not reportable to the EPA, or NY State DEC. The spill was reported to Suffolk County SHD, BNL Director's Office, and DOE-BAO.

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**Reference Materials** (e.g., work procedures, written statements, etc.):  
MSDS for UCON 170X ([here](#))

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## RELEVANT FACTS AND DATA ASSOCIATED WITH THE EVENT

Building 1005H houses 15 compressors used in the RHIC refrigerator complex to cool helium for use in the superconducting magnets in the RHIC tunnel. There are ten 1<sup>st</sup> stage compressors, and five 2<sup>nd</sup> stage. The lubricating fluid used is UCON LB170X, an oil-like heat transfer fluid. The pump is used to pump the heat transfer fluid into the bearings to remove the heat of compression. The system capacity for this compressor skid is approximately 185 gallons.

Sequence of events – at approximately 21:18 an alarm went off in the Cryogenics Control Room indicating that a compressor had shut down. Cryogenics technicians reported to the building and found the spill, and the fog from the atomized lubricating fluid. The fog had filled the single story, 5,000 ft<sup>2</sup> building so that visibility was limited to approximately five feet. Fire/Rescue received an alarm from the smoke detection system at 21:27, and responded immediately. The building exhaust fans had turned on, but didn't appear to remove the fogging mist, which was still being produced by the pressurized line. The fans were designed for helium removal and were ineffective against the heavier fog. The doors were opened to aid in ventilation. Gloves were used to avoid skin contact with the fluid since it is listed as a possible skin irritant. After several attempts, the leaking line was isolated.

Examination of the parts revealed that a steel nipple with a brass fitting on a sample tap had eventually sheared off of the newly installed redundant compressor pump. The leak started with a small slit in the fitting, which caused the fluid to atomize. The cause of the shear is most likely due to vibration from operation of the skid, or possibly from being hit. The rubber coupling on the unit was shredded indicating vibration. The pump had not been bolted to the floor. In addition, the pump may have been out of alignment despite pre-start up vibration checks by the Cryogenic group.

Because of the timely response of all parties, the spill was contained in the trench with spill pads and speedy-dry, and did not travel outside the boundaries of the area. The floor and adjacent equipment were cleaned up using spill pads. The fluid from inside the skid was pumped out and into drums. Approximately 75 gallons of fluid were recovered. There were also several drums of spill pads and speedy-dry. All fluid was contained inside the building and no fluid reached the environment.

Although the misting of the heat transfer fluid may have been cause for concern with flash fire potential, it was determined that this was an acceptable risk. It was felt that this had been addressed adequately in the Fire Hazards Analysis and compliance with general industrial designs.

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There is a sump pump in the far east end of the equipment trench, which operates on Auto. The pump is required to be operational because of discharge of cooling water from the air compressor in the building. Although the lubricating fluid did not reach the area of the pump, this could be a problem if there are any future spills.

Because of the nature of operations in this building, spills such as this are to be expected, and in fact have happened within the last year. The building was designed to contain any leaks. The personnel responded appropriately and quickly to mitigate any impact to operations, and the environment.

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### ANALYSIS OF RELEVANT FACTS AND DATA:

#### Probable Causal Factor:

1. Vibration from operation of the compressor pump caused steel fitting to shear, due to fatigue. Excess vibration may have been present because the pump had not been secured to the floor/skid.

#### Recommended Corrective Actions:

1. All similar fittings in the compressor building should be inspected for fatigue.
2. Investigate a possible re-design of the fittings to ensure reliability.
3. Evaluate the possible damage to the new pump, make sure windings were not affected.
4. Initiate a tool-box talk with cryogenics personnel on personal protective equipment. Disposable masks designed for use in oily atmospheres should have been used, as well as goggles to prevent skin contact with the mist.
5. Personnel should be instructed in the hazards with limited visibility situations (disorientation and slip hazard with the lubricant on walking surfaces) and should be instructed to keep constant communications, and use of the two-man rule. The BNL Fire/Rescue Group is available to assist with the two-man rule.
6. The cooling water from the air compressor should be directed to another effluent path so that the trench sump pump may be shut down. The trench sump pump should not operate automatically.
7. The trench effluent should be connected to the sanitary system. In the event of an accidental release of the lubricating fluid, the sanitary system would handle it.

#### Recommended Lessons Learned:

The cryogenics technicians entered an area that could have been hazardous due to the limited visibility and slippery surfaces. In this case, waiting for the mist to settle and the line pressure to diminish would not have resulted in any equipment damage, however that could have allowed the spill to reach further areas. The technicians should be instructed to weigh the consequences before subjecting themselves to any hazardous situations.

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Signature on File

#### Signature:

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Lori Stiegler  
Critique Leader

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April 24, 2001  
Date

## CRITIQUE SUMMARY



**Figure 1** Location of spill in Building 1005H



**Figure 2** Pump with fitting removed